



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
77 WEST JACKSON BOULEVARD
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304914

REPLY TO THE ATTENTION OF

September 16, 2004

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

Mr. Steve Smith
Solutia, Inc.
W.G. Krummrich Plant
500 Monsanto Avenue
Sauget, IL 62206-1198

Mr. Glen Kurowski
Monsanto Company
800 North Lindbergh Blvd
St. Louis, Mo 63167

RE:

- DNAPL Meeting held on August 24, 2004
- Comments on the GSI Summary Report with Proposed Locations for Soil Borings/Piezometers, dated August 13, 2004
- Comments on Evaluation of September 1999 DNAPL Thickness Data listed on Table 4-0c, dated August 4, 2004, Sauget Area 1, Sauget and Cahokia, Illinois

Dear Mr. Smith and Mr. Kurowski:

On August 24, 2004 a meeting was held between the United States Environmental Protection Agency (USEPA), Illinois EPA (IEPA), members of the Potentially Responsible Parties (PRP) Group, and associated consultants involved on the Sauget Area 1 site's Dense Non-aqueous Phase Liquid (DNAPL) Characterization and Remediation Study. The meeting was held to discuss the location of bedrock wells to be installed at Sauget Area 1 based on recommendations presented in the submittal by Groundwater Services Inc. (GSI), *Summary Report with Proposed Locations for Soil Borings/Piezometers, Sauget Area 1, Sauget and Cahokia, Illinois*, dated August 13, 2004, and the revised accompanying maps (Figure 3 and Figure 9) dated August 19, 2004.

The USEPA stated that the objectives for the DNAPL Characterization and Remediation Study were identified in a letter from the USEPA on January 9, 2003 *Re: Notification of Additional Work – DNAPL Characterization and Remediation Study on Sauget Area 1 Site, St. Clair County, Illinois*. These objectives included the “characterization and distribution of DNAPL within the middle and deep hydrogeologic units, the assessment of DNAPL migration under current and future site conditions, and the risk of uncontrolled DNAPL mobilization.” The USEPA stated that based on currently available information it appears that the installation of 18 new wells at Sauget Area 1 will be sufficient; however, the objectives for the study must be met and the vertical and horizontal extent of DNAPL must be delineated. Following is a summary of the issues that were discussed:

- The well proposed to be located in the north part of Cerro property, on the western side of the area surveyed, will be moved. The new proposed location of this well is within the extent of the dissolved phase plume of chlorobenzene which exceeds the one percent solubility rule, downgradient of well BR-I. This well was tentatively located near the prior sampling location AA-I-S2, however, due to current structures and construction which will soon commence for ongoing Cerro operations in this area, it is likely this well may require relocation. Mr. Grana agreed to provide drawings of the area in order to better decide upon a location for this well. It was noted that if DNAPL is observed in this well location, at least one additional well will be required downgradient to bound the extent of DNAPL. A potential backup location for this well would be near the prior sampling location AA-I-S3, along the western edge of Cerro property.
- The well proposed to be located in the north of Cerro property, on the eastern side of the area surveyed will be moved approximately 200 feet to the south, closer to the northern-most extent of the Site I waste field.
- The well proposed to be located near the existing bedrock well BR-G was discussed. This well will remain in the proposed location. It was noted that soil data from installation of the three existing bedrock wells was not collected, therefore, it is useful to locate a well near BR-G in order to collect soil and potential residual DNAPL data at this location.
- The proposed shallow well west of EE-11 in the northwest corner of Site G was agreed to be moved to the north side of Queeny Avenue, however, the location within Cerro will be checked. The new location of the shallow well will be between the location of existing wells EE-05 and EE-112.

- The proposed well located in the center of Site I was discussed. This location will not be altered.

A sample of light non-aqueous phase liquid (LNAPL) was collected during the fieldwork in May 2004 from well EE-11. As reported by GSI, the majority of the sample was not specifically characterized by the individual chemical constituents that were included in the analysis conducted. A routine full suite of analyses was run on the LNAPL sample. The results of the characterization will be sent to the EPA.

The USEPA requested that if the horizontal extent of NAPL is not characterized during drilling, that additional wells be proposed while the drill rig remains in the field. It was agreed that the horizontal extent of both pooled and residual DNAPL needs to be characterized. If significant NAPL is encountered during drilling, it was agreed there would be a flexible approach to the continued fieldwork, with meetings held between all parties to discuss the findings and path forward.

In order to provide more time during fieldwork to accommodate potential changes to the Task 4 Work Plan, the potentially "dirtiest" or perimeter locations will be drilled first. These locations will include where, based on the DNAPL survey, there may be more likelihood for NAPL to be encountered.

The general concern of anisotropic aquifer conditions potentially present at Sauget Area 1 and Area 2 sites was discussed. The groundwater flow direction may not be perpendicular to the groundwater gradient in anisotropic conditions. The direction of groundwater flow is critical to the fate and transport of the dissolved-phase plume emanating from the NAPL at the Area 1 sites. Past modeling has not been validated. An aquifer pumping test was suggested as a conclusive test to determine if anisotropic conditions exist. PRPs suggested the anisotropy would have to be significant to not observe it based on the chemical constituent plume delineation.

It was agreed that the Sauget Sites Group will present a regional picture of the groundwater, Sauget Area 1, Sauget Area 2, and the Krummrich Plant. This information is presented in the Corrective Measures Report which will soon be available for the Krummrich Plant, submitted to the Resource Conservation and Recovery Act (RCRA) division of USEPA. This information will additionally be submitted to the Sauget Area 1 and Area 2 USEPA Superfund division and IEPA parties.

Comments on Technical Memorandum: Summary Report with Proposed Locations for Soil Borings/Piezometers, dated August 13, 2004.

General Comments on Proposed Well Locations

1. The revised goals of Task 4 for the DNAPL work plan (pg 9) should not drop the previously stated Work Plan goal "to evaluate the potential extent of residual and free-phase DNAPL outside the boundaries of the fill areas". A key goal of the DNAPL Characterization is to investigate the extent of DNAPL throughout Area 1 as a comprehensive survey thereby minimizing the likelihood that further DNAPL investigation will be required in the future. In order for this goal to be accomplished, the bounds of DNAPL, whether immobile or mobile, need to be established. Additionally, this goal is necessary to achieve boundary delineation prior to the FS determination of a final remedy.
2. The DNAPL Characterization and Remediation Study should focus on objectives presented by the USEPA in the January 9, 2003 letter *Notification of Additional Work, DNAPL Characterization and Remediation Study on Sauget Area 1 Site*:
 - *"The characterization and distribution of DNAPL within the middle and deep hydrogeologic units, the assessment of DNAPL migration under current and future site conditions, and the risk of uncontrolled DNAPL mobilization.*
 - The extent and properties of DNAPL (e.g. density, viscosity, and interfacial tension); as well as the timing of the DNAPL release; topography, property, and heterogeneity of geologic units on which the DNAPL may accumulate; the existence of ongoing DNAPL releases; and transport characteristics of the bedrock.
 - *The evaluation of the DNAPL remedial options and the evaluation of the benefits and costs associated with source removal technologies (thermal technologies such as steam injection and chemically-enhanced extraction such as the use of surfactants or co-solvents)."*
3. A reference or explanation of the oil-water interface probe indication of a non-aqueous liquid in the bottom approximate seven feet at BR-H should be included in the document, although no visual evidence of DNAPL was observed at the well.
4. A sample of LNAPL was collected from one well in Area 1. When will the chemical composition and physical properties of the LNAPL be available?

5. It appears there may be a prevalent mindset by the report authors that groundwater flow occurs at right angles to the potentiometric surface contours, which is only true for a homogeneous and isotropic aquifer. Alluvial aquifers are not homogeneous and isotropic and groundwater flow is often skewed in a sub-parallel direction to river course. Therefore, some of the conclusions regarding the downgradient trend of dissolved-phase concentrations may be incorrect because the wells believed to be downgradient may not be directly downgradient.
6. The well numbers on the table on page 8 of 11 are incorrect and should be fixed.
7. The April 2004 workplan describes the installation of PVC casing and stainless steel screens. Is the PVC compatible with the DNAPL? What is the slot size of the screens? How will slot size be determined?
8. A decision logic should be established to be used during the drilling fieldwork. This logic should present how well locations may be modified and/or added based upon finding DNAPL in the first wells installed. Consequently, it would be useful to prioritize the eighteen wells to be installed.

Specific comments regarding well locations:

1. The two northern-most borings originally proposed for Site I appeared to be outside (north of) the Site I fill area as previously presented. The work plan should not define these two wells as being within the fill area.
2. A well may need to be located in the area further west of the proposed well west of BR-I where the one percent solubility rule was exceeded previously (near AA-I-S2 or AA-I-S3). It is proposed that the well located in the northwest corner of Site I be moved to this location.
3. The well located in the northeast corner of Site I should be moved further to the south, but remain within the slight trough indicated on the bedrock map.

It should be noted that if DNAPL is observed in bedrock wells at the edge or perimeter of the sites, then in order to define the bounds of the DNAPL, further wells will need to be installed to delineate the edge of the DNAPL. For example,

if DNAPL is found in the western-most well proposed at Site G, then a well further north and west will need to be installed to achieve the Work Plan and USEPA objectives.

Comments on Technical Memorandum: Evaluation of September 1999 DNAPL Thickness Data listed on Table 4-0c, Sauget Area 1, Sauget and Cahokia, Illinois, Dated August 4, 2004.

General Comments

1. This technical memo focuses primarily on field observations of the potential presence of dense, non-aqueous phase liquids (DNAPLs) made by contractors for the Potentially Responsible Parties (PRPs) during the Support Sampling Investigation in 1999 and 2000. Some reference is also made to more recent data regarding DNAPLs collected in May 2004. While the PRPs have made unsubstantiated claims in the past that the 1999-2000 data were not reliable, this is the first technical evaluation of the data presented by the PRPs. U. S. EPA appreciate the discussion of these data in a technical framework, although an earlier technical evaluation of data quality by the PRPs would have been appropriate.
2. Data regarding DNAPL measurements presented in the Field Sampling Report (FSR) prepared by O'Brien and Gere in 2000 were not qualified as inadequate or unreliable in that report or subsequent reports prepared and submitted by the PRPs or their contractors. In the absence of any quality assurance/quality control notation, those data were properly included as one factor in the overall evaluation of conditions in Sauget Area 1.

Specific Comments

3. *Page 1, third paragraph:* The text states that the results of the May 2004 NAPL survey differ significantly from DNAPL thickness data presented in Table 4-0c of the September 2001 draft EE/CA and RI/FS report prepared for the USEPA. It would be more accurate to state that the May 2004 results differ significantly from the data collected in 1999 and 2000, and reported in the Field Sampling Report (FSR) prepared by contractors for the PRPs. Table 4-0c only summarizes the data collected and reported in the FSR; it does not present any data collected independently by USEPA or its contractors. This comment applies throughout the technical memo where Table 4-0c is discussed as an independent data compilation somehow separate from the underlying work performed by contractors for the PRPs.

4. *Page 1, last paragraph:* The text states that the United States Army Corps of Engineers (USACE), contractors to USEPA, used the results of the well soundings conducted in September 1999 to conclude that “free-phase DNAPL” was widespread at Sauget Area 1, without considering other information available at that time. We note first that DNAPL is by definition free-phase. In fact, USACE considered several lines of evidence, including those presented by contractors for the PRPs in earlier drafts of the EE/CA and RI/FS report, to evaluate the potential presence and distribution of DNAPL at Sauget Area 1.
5. As stated on page 5-12 of the draft EE/CA and RI/FS report, several indicators were considered, including constituent concentrations increasing with depth; constituents found at significant concentrations deep in the alluvial aquifer; and constituent concentrations exceeding 1% of the pure-phase solubility limit in water. The field measurements of DNAPL thickness reported in the FSR were used to support the other lines of evidence, not as a sole indicator of DNAPL presence. In addition, PRPs have consistently maintained that DNAPL occurs as disseminated blobs and ganglia throughout the alluvial aquifer beneath the fill areas. Additional information pointing to the potential presence of DNAPLs includes observations of free-phase liquids within the fill materials during the 1999-2000 trenching and soil-boring activities, and the documented presence of drums in several fill areas. Appendix D of the draft EE/CA and RI/FS report, prepared by contractors for the PRPs, concludes that DNAPL dissolution is a major source mechanism for contaminants of concern at Sauget Area 1.
6. The 1999-2000 field data presented by the PRPs in the FSR were used as one indicator of the potential presence of widespread DNAPL within and downgradient of the fill areas. Contradictory indications of DNAPL using different lines of evidence and measurements are not uncommon at sites where DNAPLs are present. That is one reason the 2004 DNAPL investigation is being performed, and most likely why several different measurements were specified by contractors for the PRPs for use in that investigation.
7. *Page 3, final paragraph:* The text states that no methods were employed to visually confirm NAPL presence. The failure to confirm the measurements taken using the interface probe does not invalidate the measurements. Normal field procedure would be to verify an unexpected measurement. The lack of any effort to verify these measurements implies that the results were not surprising to the field personnel.

8. It is unclear what relevance the pace of well soundings has to the data evaluation. One conclusion could be that the pace required of the field crew resulted in inadequate procedures regarding measurement accuracy and verification.
9. *Page 4, second paragraph:* The text should be revised to indicate that the data regarding separate layers of DNAPL in seven piezometers were generated in September 1999 by field personnel under contract to the PRPs, not USACE.
10. *Page 4, fifth paragraph, last sentence:* The text states in part that the field notes "made no mention of any visual observations of free product." However, on page 3 it is stated that no attempts were made to visually verify the measurements of the interface probe. The lack of attempt to make any visual observations is different from observing a lack of free product. The fact that the field notes make no mention of visual observations is likely the result of not trying, rather than not observing any product.
11. *Page 4, final paragraph:* The reliability of the data generated during the 1999-2000 investigation is being called into question, not the tabulated presentation in Table 4-0c. The text should be revised to reflect that this is an evaluation of the underlying data quality. U. S. EPA agrees that the observations of several discrete layers of reported DNAPL at different elevations within a single well are unusual. Normal field procedure would be to verify those anomalous observations, as well as verify the proper operation of the equipment being used. No notation was found in the field notes to indicate that these measurements, while unusual, were somehow the result of improper procedures or malfunctioning equipment.
12. *Page 5, third paragraph:* U. S. EPA agrees that some observation of DNAPL would be expected during well development given the thicknesses measured during the initial survey. Contradictory measurements and observations are typically resolved by some attempt to verify the original measurements, which was not attempted until the May 2004 DNAPL investigation.
13. *Page 5, fourth paragraph:* The fact that the interface probe went off but no DNAPL was observed on October 5, 1999 may be an indication of faulty equipment at the time of that measurement. However, there is no indication in the field notes or elsewhere that the probe was checked and found to be defective either prior to the start of field activities or after the suspect

measurement. The continued use of the probe on that day by field personnel indicates that they believed it to be operating normally.

14. There is no indication that the interface probe used on October 5, 1999 was the same one used on September 28-30, 1999. If it was the same probe and it was in fact defective and provided false indications of the presence of NAPLs, one would expect the same type of erroneous measurements to occur during the later well-development activities. The field notes from September 28-30, 1999 indicate positively that DNAPL was encountered, not merely that the interface probe went off without reason.
15. *Page 6, first paragraph:* The field notes indicate that a peristaltic pump was used to purge the wells prior to sampling. It is likely that water was purged from the uppermost part of the water column within the well, where a DNAPL would not be present. The presence of a sheen in two of the wells is an observation of NAPL, although most likely an LNAPL. Assuming the interface probe was working properly for the measurements of water level and well depth, the observation of a sheen would imply NAPL in the well at a thickness less than the probe is capable of measuring (typically 0.01 inch).
16. *Page 7, first paragraph:* The final sentence should be revised to indicate that the lack of subsequent visual observations - assuming they were made and the lack of notation indicates that no product was observed - calls into question the reliability of the September 1999 data that are presented in Table 4-0c, not merely the accuracy of the tabulation.
17. *Page 7, last paragraph, continued on page 8:* GSI identified several wells with relatively low VOC and SVOC concentrations despite the presence of DNAPL reported in the field notes from September 1999. As acknowledged in the text, other wells do have elevated concentrations of VOCs and/or SVOCs. Contractors for the PRPs have used the elevated VOCs and SVOCs measured in some wells as one line of evidence among several to conclude that DNAPL is likely present throughout the alluvial aquifer beneath the fill areas. The relatively low VOC and SVOC concentrations measured in some wells result in somewhat conflicting interpretations. One objective of the current DNAPL investigation is to resolve these inconsistent data and interpretations.
18. *Page 8, section 4.4, first paragraph in section:* The text should be revised to indicate that the DNAPL measurements downgradient of Site N were presented in the FSR, not just Table 4-0c.

19. *Page 8, final paragraph:* GSI's understanding that Site N was historically used to dispose of concrete rubble and demolition debris conflicts with the data collected by contractors for the PRPs and presented in the FSR. Test-trench logs presented on pages 42-48 of Volume 8 of the FSR revealed the presence of damaged and rusted drums in Site N. A "whitish material" was observed in the drums, with PID readings up to 893 parts per million. A similar whitish material was observed discharging from the northwest corner of the Site N trench. Observations of DNAPL downgradient of Site N are not inconsistent with the presence of damaged and rusting drums within the fill area.
20. *Page 9, conclusions:* The text should be revised to reflect that the author concludes the data collected during the September 1999 investigation is unreliable. Table 4-0c only summarizes the data presented in the FSR. It does not present any new data or data collected by anyone other than the contractors for the PRPs.
21. The fact that there are no visual observations or other evidence to support the DNAPL measurements made in September 1999 largely reflects the lack of any attempt to collect such evidence at that time. The use of inadequate field procedures and uncalibrated, defective, or improperly maintained equipment by a rushed field crew necessitates confirmation of the data. These factors do not lead unequivocally to the conclusion that DNAPL is not widespread at Sauget Area 1, especially when other data and lines of evidence clearly point to the presence of NAPLs, including DNAPL, in many parts of the site.
22. The absence of visual observations of DNAPL in the September 1999 data listed on Table 4-0c- The visual observation of DNAPL either on interface probes, bailers or pumps is a confirmation that the interface probe is working properly. It would have been helpful if the GSI TM would have described the DNAPL in terms of specific gravity, chemical composition and appearance. Some DNAPL can be nearly clear and difficult to observe whereas other DNAPL is highly weathered, discolored and readily distinguishable in the field. The TM refers to a sample collected from one of the bedrock wells that was sent for chemical analysis, but no data are included.
23. The oil/water interface probe was either not working or used improperly by field personnel - interface probes can be difficult to maintain in the field because the probes may become fouled and give a false positive indication of DNAPL. The TM discredits the contractor for moving too fast in the

measurement of NAPL and water levels, yet many of the wells/piezometers appear to be co-located, which would allow for the rapid collection of data.

The GSI measurement event in May 2004 used two methods to indicate the presence of DNAPL: 1) a weighted cotton fiber rope was lowered to the bottom of the well where DNAPL could be absorbed into the fibers and 2) a clear bailer was lowered to the bottom of the well. Both of these methods are qualitative in that the methods can be used to indicate the presence of DNAPL but not the thickness. These methods are consistent with EPA's September 1994 report: *DNAPL Site Characterization*, EPA/540/F-94/049.

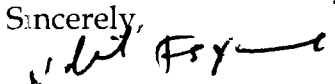
24. The absence of low permeability layers in the alluvial aquifer that would allow for the pooling of DNAPL – the presence of low permeability layers is not necessary for the creation of minor pools of DNAPL which could then be manifested within the well casing as a much thicker pool than actually resides in the formation. GSI concluded in their *Source Evaluation Study, Sauget Area 1* (GSI, May 21, 2001): "Small horizontal pools of DNAPL are present throughout the entire vertical extent of the saturated zone, and not just at the bottom of the unit". Minor DNAPL pools can occur at depositional bedding changes that may be imperceptible in the visual/manual classification process for soils. Significant pools of DNAPL are most likely to occur at the contact between the alluvium and bedrock.
25. Comparison to dissolved-phase concentrations as indicators of the presence of DNAPL – The use of dissolved-phase concentrations as indicators of the presence of DNAPL within an aquifer is a useful tool in evaluating the presence of DNAPLs. The use of dissolved-phase concentrations is predicated on having good three-dimensional coverage of the aquifer by wells that utilize fairly short screens (10 feet or less).
26. Information regarding the historical operations at Site N – the use of anecdotal data is often incomplete and may not reflect all disposal activities that occurred. The infrequent disposal of a small number of drums over long periods of time could result in a significant accumulation of DNAPL in the landfill material.
27. Table 2-1 – Results of May 2004 NAPL Survey - Well BR-H – it should be reported that there was an indication of DNAPL at this well as a tone change on the oil/water interface probe was observed in the bottom 7 feet at the well (from approximately 110 feet to total depth at 117 feet below top of casing) even though visual observations did not confirm presence of NAPL.

U. S. EPA had concluded from the review of the memorandum:

- A significant thickness, although low yield of LNAPL is present at well EE-11, Site G.
- DNAPL is present at two bedrock wells, BR-G and BR-I at sites G and I, respectively.
- DNAPL is a primary source of dissolved-phase contamination at sites G and I.
- Dissolved-phase concentrations indicate the likely presence of NAPL in the formation at Site H.

Within 21 days of receipt of this letter, Respondent(s) shall submit to U.S. EPA a revised Summary Report with Proposed Locations for Soil Borings/Piezometers and a revised Evaluation of September 1999 DNAPL Thickness Data listed on Table 4-0c. If you have any questions regarding this letter, please do not hesitate to contact me at 312/886-6840.

Sincerely,



Nabil Fayoumi
Remedial Project Manager
Superfund Division

cc via e-mail

Sandra Bron, IEPA
Mike Coffey, USFWS
Michael Henry, IDNR
Karen Torrent, USDOJ
Chris English, CH2MHILL
Walter Weinig, Laramide

bcc:

file room
Ken Bardo, USEPA
Thomas Martin, USEPA
Thomas Short, USEPA